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Description method to the fabrication micromechanical structures the instant invention concerns a method to the fabrication micromechanical structures, which are formed on a basic body and are from a cover body before destruction protected.

Micromechanical structures become z. B. as acceleration sensors for the Airbag release used. The micromechanical structures consist thereby of free carrying members how diaphragms or feather/spring bars or similar, which become bent with influencing an acceleration. On the basis the deflection a value for the acceleration becomes determined.

Micromechanical structures become z. B. at the surface of a basic body disposed and of a cover body before environmental influences, like mechanical or also chemical destruction protected.

Methods to the fabrication micromechanical structures are z. B. in Sven Michaelis and Hans Jörg Timme, Acceleration Threshold Switches from to additives Electroplating MEMS Process, euro sensor XIII, The 13th European Conference on solvently State Transducers, September 12-15.1999, The Hague, The Netherlands; in M. Wycisk, T. Tönnesen and J. Binder, S. Michaelis and H. J. Timme, Low Cost post office CMOS integration OF Electroplated Microstructures for inertially Sensing, and in M.

Wycisk and J. Binder, S. Michaelis and H. J. Timme, new sensor on chip Technology for Micromechanical Acceleration Threshold Switches, indicated.

A method to the cover micromechanical structures is z. B. in Sven Michaelis, Hans Jörg Timme, Michael Wycisk, Josef binder, additives Electroplating Technology as A post office CMOS Process for the Production OF MEMS Acceleration Threshold Switches for Transportation Applications, described. A particular prepared becomes cover body with cavities at its underside, in which the micromechanical become structures protected, which are disposed on the basic body, used. Further continuous holes are disposed in the cover body, accessible in which the Kontaktpads of the basic body is after the assembly of the

basic body and the cover body. Goods these holes present, then the structure would not be not contactable.

The holes in the cover body lead to the fact that this is brüchig and susceptible to tears. This leads again to low yields and high costs. In addition the fabrication of the holes is a lengthy etching process over six of the hours in claim takes and therefore is cost-floating.

An other method for taking micromechanical structures off and opening the Kontaktpads exists in the use of sawing procedures, become stated with which large pieces of the cover body out and are abgeschwemmt in the sawing flushing. In addition the Abschwemmen of the large pieces saves a large risk for the damage of the structures and leads to breakages of the saw blade.

The object of the invention a method is to be indicated, by which a basic body and a cover body at their surfaces are together added and in a simple manner at least a part of the joined surface of the Grundkörper becomes pers exposed.

Erfindungsgemäss wird die gestellte Aufgabe durch ein Verfahren zur Herstellung einer mikromechanischen Struktur mit den folgenden Schritten gelöst : Assembly of a basic body with a cover body along a common interface to a composite body, whereby in the composite body along the interface a cavity formed will and the cavity becomes opened by removal of material into the region of a surface of the composite body.

The advantage of the invention process lies in the very simple cover of the micromechanical structure. Superficially silicon covers cannot only be used, which necessary with the methods of the state of the art are, in order along (111) - orientation of the silicon crystal along to corrode. Kostengünstigere Materialien können entsprechend der Erfindung auch verwendet werden, wie Glasabdeckungen oder Abdeckungen aus Kunststoff.

Furthermore the time is substantially shortened, since no continuous holes etched to become to have, to the fabrication of a cover, which would usually last six hours.

Furthermore corroding the holes saves the disadvantage that errors in the lacquer mask and/or. Tears into the silicon wafer, of which the cover consists, by which prolonged etching time are strengthened.

This leads in accordance with the state of the art the manufactured to a low yield of covers becomes.

An other advantage of the invention process consists in the possibility to use an unstructured cover and to arrange the micromechanical structures in recesses on the basic body. By this method the covers can become very inexpensive formed.

An other advantage of the invention process consists of the fact that the covers from a plastic formed to become to be able.

The further possible invention process to only form recesses in the cover body received in which the micromechanical structures become with the assembly of the Grundkörper and the cover body.

In a favourable development of the invention process the cavity becomes opened, in which the material is at least partly sawed in into the region of a surface of the composite body with a circular saw. Thus it is possible to use nowadays when sawing wafers for single chips used methods for the invention process. This has the advantage that no machine additional expenditure is necessary with the invention process.

Further it is favourable to arrange the composite body to saws of the cover body with a surface of the basic body on a carrier. With the carrier it concerns usually a foil, becomes laminated on which the basic body. It is by this method and this arrangement möglich to only saw the cover body in while the basic body on the carrier is fixed.

An other advantageous method plans to arrange the composite body to saws of the basic body with a surface of the cover body on a carrier. With this method the composite body can become with the help of the cover body on a foil laminated and during the subsequent sawing process can to the one the basic body alone or however with a deeper depth of cut both the basic body and the cover body be through-sawed. In the conditions of the technique it is conventional to up-laminate wafers on a foil and divide with a circular saw, whereby the wafer is only sawed and the foil remains intact. This method can become also for the invention process applied.

In an other favourable development of the invention process an electrical contact formed in the cavity becomes at least partial exposed. By this procedure it is possible to connect electrical contacts during a subsequent bond process with a Leadframe electric.

In an other favourable development of the invention process a recess becomes formed in the cover body, which forms the cavity after the assembly of the basic body and the cover body. By this method a simple formation of the cavity is possible to the pick of the micromechanical structure.

In an other favourable development of the invention process a recess becomes formed in the basic body, which forms the cavity after the assembly of the basic body and the cover body. By this arrangement it is possible, electrical contacts, which are formed in the cavity to open by the invention process.

It participates particularly favourable that the cover body does not have to become structured. Thus costs can become with the fabrication of the cover body saved.

Further it is favourable that the cover body becomes assembled by means of eutectic bonding, silicon fusion bonding, anodic bonding, sticking and/or solders with the basic body. These techniques are for the example in micro mechanical NIC, A.

Heuberger, Springer publishing house, 1991, described.

An other favourable variant of the invention process plans that the cover body consists of silicon, of glass of plastic, of a polymer or a polyamide.

In the conditions of the technique one is limited on the use of silicon as cover bodies. The use of silicon wafers as cover bodies is relative thereby expensively so that the costs with the use of glass or plastic reduced to become to be able.

In an other favourable development of the invention process the basic body is niert on a foil lami and the cover bodies with sawing cuts severed.

By this method it is possible to select the depth of cut of the circular saw in such a way that only the cover body becomes severed over possibly. To saw and the basic body unchanged leave cavities. Favourable way the sawing cuts become with the fact so performed that no loose pieces, apart from the sawdust, from which cover bodies are ripped out and it becomes so avoided that structures on the base and/or. the saw blade destroyed become.

In an other favourable development of the invention process will the composite body with the cover body on a foil laminated and the composite body becomes with other sawing cuts through-stated, whereby separated chips become stated out. By this method the composite body can, after the cover body was sawed in by the foil detached becomes and now subsequent with the cover body on the foil laminated becomes. By this Topdownanordnung (the basic body is with its surface, on that the micromechanical structures and the electrical contacts disposed is the foil directed) the Verbundkörper can be sawed by and be remained the loose Stücke* on the foil.

An other method step plans now that the sawingdeep of the circular saw becomes a so selected that the entire composite bodies existing from basic body and cover body in a sawing cut become severed, so that separated chips, which remain sticking further on the foil, become out stated.

In an other favourable development of the invention process a separated chip with a vacuum pipette of the foil becomes dissolved and the parts of the cover body, which were disposed above the electrical contact, remains on the foil. By this method it is possible to replace the

separated chips of the foil whereby the starting from covering, which were original disposed over the electrical contacts, remain sticking further on the foil.

In an other favourable development of the invention process a chip exhibits electrical contacts at at least a pp after sawing the composite body. Chips exhibit usually a rectangular form, whereby in this variant a pp of the chip is provided with elektri schen contacts.

In an other favourable development of the invention process the chip exhibits electrical contacts at a pp and at at least an adjacent side after sawing the composite body. By this arrangement it is possible to increase and to two adjacent sides of a chip distribute the number of the electrical contacts.

In an other favourable development of the invention process the chip exhibits electrical contacts at a pp and at an opposite located pp after sawing the composite body. By this arrangement of the electrical contacts it is possible to increase their number.

Thus smaller chips become possible, which exhibit a larger number of contacts. Likewise the integration of more functionality on the chip is possible, like z. B. the integration of a micro controller, whereby itself the product variety increased.

In an other favourable development of the invention process the chip exhibits electrical contacts after sawing the composite body at at least three adjacent sides. It is possible to increase the number of the electrical contacts still more other.

Other advantageous embodiment of the invention are in the Unteransprüchen indicated.

Embodiments of the invention become subsequent explained on the basis the designs shown and.

In the figs show: Fig 1: an embodiment of a according to invention mi kromechanischen structure; Fig 2 the embodiment of a micromechanical

Structure in accordance with fig 1 to a later process time; Fig 3 the embodiment in accordance with fig 1, whereby that

Composite body in single chips is sawed; Fig 4 an other micromechanical according to invention

Struktur ; Fig 5 the micromechanical structure according to invention out

Fig 4 at a later process time; Fig 6 the micromechanical structure according to invention out

Fig 5, whereby the composite body is pariert in single chips SE; Fig 7a a cross section by micro according to invention a mechanical structure; Fig 7b the top view on mikromecha the niche according to invention structure from fig 7a, to the formation one

Chip with electrical contacts at a pp of the

Chip; Fig 8a a cross section by an other micromechanical structure according to invention;

Fig 8b the top view on the structure kromechanische in fig 8a represented mi, whereby electrical contacts are so disposed that during disjoining of federation body single chips develop, which exhibit elektri sche contacts on two opposite located pp; Fig 9a a cross section by an other micromechanical

Structure; Fig 9b the top view on the structure kromechanische in fig 9a represented mi, whereby the electric

Contacts so disposed are that the chips after that

Disjoint electrical contacts at two benachbar ten pp exhibit; Fig 10a an other micromechanical according to invention

Structure in the cross section; Fig 10b the top view on the micromechanical structure represented in fig 10a, whereby electric Kon of clocks is so disposed that each chip after that Disjoint at three adjacent sides electric

Contacts exhibits.

In fig 1 is a micromechanical structure according to invention shown, which consists of a basic body 1, and with the cover body 2 at a common interface 3 connected is. On the basic body 1 are 9 disposed thereby a micromechanical structure 17 and an electrical contact.

The basic body 1 is for his part 8 mounted on a carrier, which consists in this case of a foil 10. In this case thus the composite body is 4, which consists of the Grundkörper by 1 and the cover body 2, 10 laminated on the foil. In the composite body 4 a cavity is 5 disposed, in which the electrical contact 9 is. Further a cavity 18 is in the composite body along the gemy seed interface 3 disposed, in which the micromechanical structure 17 is. Now the cover body is announced along the dotted line 19 with a circular saw. The electrical contact 9 and the basic body 1 remain to a large extent intact.

Subsequent one becomes the composite body 4 of the carrier 8 detached and with reference to fig 2 with the cover body on the carrier 8 mounted, as the cover body becomes 2 10 laminated on the foil.

Significant one is to be recognized in fig 2 the aperture 16, which resulted from announcing 19 of the cover body 2. With an other sawing step 20 the composite body severed becomes.

Sawing runs in such a way that the cavity 5 is at least partly through-sawed, so that the separated chip 11 represented in fig 3 develops.

First sawing 19 becomes so performed that no fragments from the cover body 2 are ripped out, which could destroy the saw blade. The Durchsägung 20 becomes so performed that the depth of cut is sufficient to split the Verbundkörper by as entire one however the carrier 8 its function as carrier material maintains, and not severed becomes.

With reference to fig 4 is an other embodiment of the invention shown. The difference to fig

1 consists of the fact that the cover body is to a large extent unstructured 2 and the cavity 5 with the electrical contact 9 located in it and the other cavity 18 with the micromechanical structure 17 located in it are in the basic body 1 formed. The advantage of the variant of the invention represented in fig 4 exists in the utility of an unstructured cover body 2. The cover body 2 at a surface pointing outward 7 is sawed in also here, so that the material becomes 6 remote.

Subsequent one becomes the composite body 4 of inertial subject the aluminium 8 dissolved and with reference to fig 5 with the cover body 2 on the carrier material, which consists in this case of a foil, laminated. With reference to fig 5 the composite body 4 becomes 20 through-stated along the dotted line, whereby a separated chip 11 develops.

In fig 6 a separated chip is existing from a basic body 1, a cover body 2, which are at a common interface 3 connected, shown. Further a micromechanical structure is 17 in the cavity 18, which is 2 disposed between the basic body 1 and the cover body.

With reference to fig 7a and fig 7b becomes a sawing procedure described, with which from a composite body 4 separated chips 11 out stated to become to be able, the electrical contacts at a pp exhibit. In fig 7b the top view is 4 shown on a composite body. Hatched one underlaid is that late resultant separated chip 11. In the composite body is a cavity 5, which becomes 2 opened with an announcing 19 of the cover body. With the Durchsägung 20 the composite body in single chips becomes 11 disassembled.

After dividing into single chips are electrical contacts 12 at a pp of the chip 11.

With reference to fig 8a and fig 8b becomes a sawing procedure for the fabrication of single chips described, are 15 disposed with which electrical contacts on a pp 13 and on an opposite located pp.

With reference to fig 8b two series of electrical contacts are 9 in the cavity 5 disposed. With an announcing 19 of the cover body 2 the cavity becomes 5 opened. Anschlie Bend becomes the composite body with the cover body on a Fo lie 10 laminated and the composite body with the Durchsägung 20 into separated chips divided.

With reference to fig 9a and fig 9b is an other Ausführungsbeispiel for sawing a composite body shown.

With reference to fig 9b are electrical contacts 9 at two pp of the chip disposed. First the cavity 5 with announcing 19 opened, subsequent is sawed the Abdeckkörper by 2 on the foil 10 laminated and the composite body 4, existing from basic body and cover body, as whole. During sawing develop separated chips 11, which exhibit electrical contacts at two adjacent sides.

With reference to fig 10a and fig 10b becomes a manufacturing method for separated chips described, which exhibit electrical contacts at three adjacent sides.

On a basic body 1 two series of electrical contacts become 9 disposed. Subsequent one becomes a cover body 2 with the basic body 1 connected, so that the electrical contacts are 9 into the cavity 5 disposed. With a Ansä gung 19 of the cover body 2 the cavity 5 opened becomes. Subsequent one becomes the composite body with the cover body on a foil 10 laminated. With the Durchsä gung 20 the composite body 4 into separated chips 11 is sawed.

By that in the described above method used bilateral saws of the composite body 4 with several SAE getiefen, can become the electrical contacts free placed, without pieces of the taking off wafer separate and are abgeschwemmt in the sawing flushing. The electrical contacts are in cavities disposed thereby which become opened in a first sawing step, as the cover body 2 is sawed in. With this first sawing process the composite body 4 with the basic body 1 is 10 laminated on the foil. The sawingdeep is to be selected with the fact in such a way that only the cover body severed will remain and the structures on the basic body obtained. The sawing lines are so disposed with the fact that particular parts of the cavity 5 are concerned, but no "loose part from the cover body 2 out stated become.

It means that supports obtained remain at those the announced parts of the cover body first attached to remain. 'After the first sawing step the composite body of the foil remote and with the cover body becomes again on the foil laminated. In a second sawing step the Verbundkör becomes by, which consists of the basic body and the cover body, complete severed. Nach dem zweiten Sägeschritt sind vereinzelte Chips entstanden, die auf der Folie kleben. These can become now with standard methods of the sawing foil dissolved. The parts of the cover body, which lay over the electrical contacts, remain sticking on the sawing foil.

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Claims 1. Method to the fabrication of a micromechanical structure with the subsequent method steps: - Assembly of a basic body (1) with a Abdeckkörper by (2) along a common interface (3), egg nem composite body (4), whereby in the composite body (4) along the interface (3) a cavity (5) formed becomes, characterised in that the cavity (5) by removal of material (6) in the region of a surface (7) of the composite body (4) opened becomes.

2. Process according to claim 1 characterised in that the cavity (5) opened becomes, as the material (6) in the region of a surface (7) of the composite body (4) is at least partly sawed in at least with a circular saw.

3. Process according to one of claims 1 or 2 characterised in that of the composite bodies (4) to saws the cover body (2) with a surface of the basic body (1) on a carrier (8) disposed becomes.

4. Process according to one of claims 1 to 3 characterised in that of the composite bodies (4) to saws the basic body (1) with a surface of the cover body (2) on a carrier (8) disposed becomes.

5. Verfahren nach einem der Ansprüche 1 bis 4 dadurch gekennzeichnet, dass ein in dem Hohlraum (5) gebildeter elektrischer Kontakt (9) zumindest teilweise freigelegt wird.

6. Process according to one of claims 1 to 5 characterised in that in the cover body (3) a recess formed becomes, which forms the cavity (5) after the assembly of the basic body (1) and the cover body (2).

7. Process according to one of claims 1 to 6 characterised in that in the basic body (1) a recess formed becomes, which after the assembly of the basic body (1) and take off-- body (2) forms the cavity (5).

8. Process according to one of claims 1 to 7 characterised in that it with the basic body (1) silicon, gallium arsenide, ceramic or glass concerns.

9. Process according to one of claims 1 to 8 characterised in that of the cover bodies (2) by means of eutectic bonding, silicon fusion bonding, anodic bonding, sticking and/or solders with the basic body (1) assembled becomes.
10. Process according to one of claims 1 to 9 characterised in that of the cover bodies (2) of silicon, glass or plastic consists.
11. Process according to one of claims 1 to 10 characterised in that of the basic bodies (1) on a foil (10) laminated will and the cover body (2) with sawing cuts severed becomes.
12. Process according to one of claims 1 to 11 characterised in that of the composite bodies (4) with the cover body (2) on a foil laminated becomes and other sawing cuts the composite body (4) announcements, whereby a separated chip (11) becomes out-stated.
13. Process according to claim 12 characterised in that the separated chip (11) with a vacuum pipette of the foil dissolved will and the parts of the cover body (2), which above the electrical contact (9) disposed were, on the foil to remain.
14. Process according to one of claims 1 to 13 characterised in that after sawing the composite body (4) a chip (11) electrical contacts (12) at at least a pp (13) exhibits.
15. Process according to one of claims 1 to 14 characterised in that after sawing the composite body (4) the chip (11) electrical contacts (12) at the pp (13) and at least an adjacent side (14) exhibits.
16. Process according to one of claims 1 to 15 characterised in that after sawing the composite body (4) the chip (11) electrical contacts (12) at the pp (13) and an opposite side (15) exhibits.